For some twelve years the native explorers of the Indian Survey had the field to themselves, and it may safely be said that no Asiatic geographers of the past, not even the Arab adventurers of the Middle Ages, or the Chinese pilgrims of yet earlier times in search of such evidences of their Buddhist faith as were to be found on the frontiers and plains of India, ever established such a remarkable record of geographical accomplishment as did these Lamas and Pandits of Indian Survey history in so short a time. Their success was due primarily to the fact that they were well selected for the special line of exploration which they were expected to follow. Then they were thoroughly well trained in the first elements of geographical reconnaissance by Indian Survey officers.

As a rule their methods were simple, for they included no more than the first principles of traversing on bearings taken by the prismatic compass, distances being measured by pacing, and occasional most valuable checks being derived from latitude observations with the sextant. This involved the use of small instruments which were concealed either in their clothes or in false bottoms to their boxes. A rosary was the convenient means of checking their paces. Considering that many thousands of miles were covered in this way, and that the final reduction of their voluminous records (concealed usually in the lining of their coats) was most satisfactory, no higher and better evidence of the patience and determination of such men as Nain Singh, Kishen Singh (the A–K of the Survey records), or of Ugyen Gyatso could be desired. They were frequently engaged for years on the same quest; they were occasionally caught and enslaved, but almost always managed to save their instruments and their records; and their journeyings carried them across the great plateau to Mongolia and China, and into regions where hitherto no European has followed them.

With the influx of European explorers, started by the remarkable discoveries of Bower, the later stories of Tibetan exploration became public property, but it should be noted that many of the most successful of these later white adventurers have employed native explorers to do the spade work of their geographical mapping, and that with the close of the period indicated in this useful volume (which has conveniently brought together information hitherto scattered and rather difficult to retrieve) the work of the native geographer has by no means come to an end. Another and an even greater volume might follow which should show how much our well-known Tibetan travellers owe to the indefatigable perseverance and the remarkable skill as topographers of their native assistants.

Col. Lenox Conyngham's compilation merely brings together the narratives of the earliest native adventurers, and no book of travel that ever was written contains such a wealth of thrilling personal incident as underlies the simple (and sometimes prosaic) account of these humble Indian workmen.

T. H. H.

NOTES.

A SPECIAL meeting of the Royal Society was held on Thursday, January 22, when the Prince of Wales was admitted a fellow, following election by ballot, which took place on May 22, 1919. This election was in pursuance of a clause in the society's statutes which permits any one of his Majesty's subjects who is a Prince of the Blood Royal to be proposed at one of the ordinary meetings by any fellow, provided such proposal shall have been made at a preceding meeting. Under this provision King George V. was elected in 1893 when Duke of York. His Royal Highness was received in the society's vestibule by Sir Joseph Thomson and the officers and vice-presidents, whence, preceded by the mace-bearer, a procession was formed through the ranks of the fellows to the meeting-room. The Prince occupied a seat on the front bench among the fellows. The senior secretary having announced the attendance, his Royal Highness advanced to the president's table and subscribed his name in the charter book, thereupon taking a seat on the left of the president. An attractive discourse was then given by Prof. W. H. Bragg on methods of detecting submarines by sound. Upon its conclusion the Prince thanked the society for his admission, and assured the fellows of his interest in the advancement of scientific research.

DISTURBANCES of wireless messages are commonly known to all operators, and are usually regarded as atmospheric effects. Mr. Marconi, however, in a statement published in the *Daily Mail* of January 27, describes interruptions which occur simultaneously in London and New York, and in which certain long and short signals are repeated more frequently than others, as, for example, the three dots signifying the letter S in the Morse code. In the absence of a physical explanation of these regular and simultaneous interruptions, it is perhaps human, and certainly sensational, to suggest that the signals represent attempts of intelligent beings on another planet, or the moon, to communicate with the earth. The *Daily Mail*, therefore, refers to "recent investigations by Prof. Lowell with his giant telescope" of Martian canals (Prof. Lowell died in 1916), and to Prof. W. H. Pickering, who "has caused extraordinary interest in the United States by recently announcing that he sees signs of life on the moon," though these views have been before the astronomical world for many years, and the phenomena observed admit of other interpretations. The interruptions described by Mr. Marconi are no more wonderful than the magnetic disturbances long registered in magnetic observatories. Such disturbances of the photographic records are often very definite in character, and occur at about the same hour on successive days, while they are also found to occur simultaneously at stations so far apart as Christchurch (N.Z.) and Kew. The magnetic and wireless effects are closely related, but whether they originate in the sun or arise from a common cause operating throughout the solar system has yet to be determined. That they are signals from other worlds is attractive to the imagination, but the hypothesis is more of popular than of scientific interest.

It is with deep regret that we record the death of Dr. C. R. C. Lyster on January 26 at the age of sixty years. Dr. Lyster held the position of head of the X-ray and electro-therapeutic departments at the Middlesex Hospital during the last seventeen years. Even in quite the early years of radiology Dr. Lyster made extensive use of X-rays in the treatment of disease, especially cancer. It was at this period, when the harmful nature of repeated fractional doses was not known, that he himself sustained damage which afterwards developed into the disease he sought to alleviate in others. Dr. Lyster fully realised the additional risks he ran by continuing his work, but nothing could deter him from pursuing it, and his work of later years should be viewed in the light of a sacrifice on his part to the cause of advance in medicine. Dr. Lyster was president of the electro-therapeutic section of the Royal Society of Medicine for the year 1918–19, and served on its council and on that of the Röntgen Society for a number of years. His publications were few, and provide no adequate guide to the value of his services to medicine, especially to medical radiology. The recent institution of a diploma in radiology and electrology by Cambrige University was largely due to the efforts which Dr. Lyster made in the first instance. Throughout the whole of his work he combined in a rare degree a breadth of outlook and an unselfishness of purpose which ensured a respect for his views and counsel. Of his personal charm and character a wide circle will preserve a permanent memory.

The Rev. Edmund Warre, D.D., who died at Eton on January 22, the anniversary of the death of Queen Victoria, was a notable and commanding figure in the Victorian age. During his headmastership of Eton, which lasted from 1884 until 1905, many new buildings, including three science laboratories, were added, and science teaching, more particularly with a view to military requirements, was extended and developed. Dr. Warre was in the habit of saying that, like the horse-leech, Madam Science had many daughters, all crying "Give, give"; but he was a generous and wide-minded man, whose own scientific tastes lay in the direction of botanical work. His ruling passion, however, was for the river, and he used frequently to lament that, because his mathematical training had been reglected, he was unable to work out satisfactorily the ideal lines of a racing-boat. Dr. Warre had been for some years an invalid, and he retired from the Provostship of Eton in 1918. No man can have had a wider circle of friends, and he will be remembered with affection and esteem by many men of science.

The award of the Straits Settlement gold medal, founded by Scottish graduates in the Malay States, to Dr. R. T. Leiper was announced in our last issue. The medal is given for the best thesis for M.D. on a subject of tropical medicine offered during the last five years, and is awarded by the Senate of the University of Glasgow. Dr. Leiper's thesis, for which he gained a Bellahouston gold medal in 1917, comprised an account of the brilliant work which he did on Bilharzia disease in Egypt (1915–16), whither he was sent by the Government as consultant parasitologist and Lt.-Col., R.A.M.C., to investigate the disease and to advise as to preventive measures in connection with the troops. It will be recalled that by his researches Dr. Leiper established the existence of two species of parasites in human bilharziosis, traced their life-history outside the human body in molluscs, and demonstrated the modes of infection, besides elucidating numerous other points. The award of this medal by Dr. Leiper's university is a fitting recognition of an epoch-marking advance in parasitology.

British botanists have an opportunity of showing practical sympathy with the eminent French bryologist, M. Jules Cardot, who has suffered severely from the effects of the war. Driven from his home at Charleville by the German advance in 1914, M. Cardot had to abandon all his possessions. He has now returned to find that the greater part of his property has been destroyed or removed, including his books and MS. notes and a large portion of his collections. Fortunately, his mounted herbarium of mosses, containing between 30,000 and 40,000 specimens, representing more than 10,000 species, is practically intact. The herbarium is a valuable one, containing the types of a large number of new species described in M. Cardot's numerous monographs of various families and works on the geographical distribution of mosses. It is M. Cardot's wish that his herbarium should find a home in the Paris Natural History Museum, but with his present restricted means he is unable to make a gift of it to the nation, and the museum has not sufficient funds at its command for the purchase. A suggestion has been made by bryological friends, simultaneously in the United States and this country, that if the museum authorities will find half the amount required the remaining half might be raised in Great Britain and in America. The authorities in Paris have gratefully expressed their willingness to agree to such a scheme, and the price of 10,000 francs has been mentioned. The proposal to raise one-fourth of that amount in this country would at the present rate of exchange entail a sum of between 60*l.* and 70*l.* The well-known British bryologist, Mr. H. N. Dixon, is acting as treasurer of the fund, and his address is 17 St. Matthew's Parade, Northampton.

Dr. Edwin Deller, secretary of the Brown Animal Sanatory Institution, University of London, has been appointed assistant secretary to the Royal Society.

With the approval of the Lords Commissioners of the Treasury, Major H. E. Wimperis, R.A.F., has been transferred from the Office of the Crown Agents for the Colonies to the Air Ministry, to take up the position of Head of the Air Navigation Research Section.

We are informed that the council of the Glass Research Association has appointed Mr. R. L. Frink, Lancaster, Ohio, U.S.A., director of research. The secretary of the association says:—"Mr. Frink has a lifelong experience of the American glass trade and glass research, is well known to the foremost English glass manufacturers, and his appointment is welcomed by the British glass industry."

THE death is announced, in his seventy-second year, of Mr. R. L. Garner, the American author who published a book on "The Speech of Monkeys" in 1892, and afterwards visited the Gaboon, the country of the gorilla, where he stated he lived for some months in a steel cage to study the language of the great apes. On his return to London, early in 1894, Mr. Garner delivered a lecture on his experiences, which attracted a large audience, but clearly showed that science had nothing to expect from his enterprise.

WE regret to record the death on January 24 of Mr. R. F. Wallace, who retired from the Meteorological Office at the close of last year. Mr. Wallace was in his sixty-eighth year, and should have retired some two years ago, but remained in the service during the closing period of the war. He entered the Meteorological Office in 1883, and first served in the marine division. About twenty years ago he took general charge of the meteorological instruments.

INFLUENZA seems to threaten to be prevalent in this country before long, judging by the outbreaks in America and elsewhere. Since the commencement of October influenza has been present to a limited extent in the British Isles. The deaths in the ninety-six great towns of England and Wales have risen from 14 and 20 in the two closing weeks of September last to 70 or 80 deaths per week at frequent intervals during the autumn and winter. In London the deaths rose to 22 in the weeks ending November 15 and 22, but they have not touched 20 in any week since, according to the returns of the Registrar-General to January 17. The highest death-rate is between twenty and sixty-five years of age, the deaths for those ages in the last thirteen weeks being 59 per cent. of the total number.

IN the current number of the *Annales de la Société Royale Zoologique et Malacologique de Belgique* appear the names of ten honorary members who have recently been elected to that society. Among the names are those of Prof. L. Cuenot, Faculté des Sciences, Nancy; Prof. M. Caullery, the Sorbonne, Paris; Dr. A. E. Shipley, Christ's College, Cambridge; Senator B. Grassi, Italy; Prof. E. G. Conklin, Princeton University; and Prof. Th. H. Morgan, Columbia University.

THE annual meetings of the Institution of Naval Architects will be held on Wednesday, March 24, and the two following days, in the hall of the Royal Society of Arts, John Street, Adelphi, W.C.2. The Right Hon. the Earl of Durham, president, will occupy the chair. A gold medal will be awarded by the council to any person not being a member or associate member of council who shall at the forthcoming meetings read a paper which, in the judgment of the council, is deemed to be of exceptional merit.

OWING to the prevalence of diseases in prepared timber, and in view of the impending increase in the use of timber—much, possibly, of immature growth—in building construction, the Science Standing Committee of the Royal Institute of British Architects, under the chairmanship of Mr. Alan E. Munby, has had the question of such defects under review, and Dr. C. J. Gahan, of the Natural History Museum, has been asked, and has consented, to associate himself in an advisory capacity with this inquiry. The committee will welcome any information which seems likely to further such investigations. Correspondence should be addressed to the Secretary, Royal Institute of British Architects, 9 Conduit Street, W.1, and marked "Science Committee."

THE following awards have been made by the council of the Institution of Mining and Metallurgy:—(1) Gold medal of the institution (premier award, and the highest distinction within the power of the institution to confer) to Mr. H. Livingstone Sulman, in recognition of his contributions to metallurgical science, with special reference to his work in the development of flotation and its application to the recovery of minerals. (2) "The Consolidated Gold Fields of South Africa, Ltd." gold medal to Mr. William Henry Goodchild, for his papers on "The Economic Geology of the Insizwa Range" and "The Genesis of Igneous Ore Deposits." (3) "The Consolidated Gold Fields of South Africa, Ltd." premium of forty guineas to Dr. Edward Thomas Mellor, for his paper on "The Conglomerates of the Witwatersrand."

AT the annual general meeting of the Royal Meteorological Society, held on January 21, the following officers and council were elected:—*President:* R. H. Hooker. *Vice-Presidents:* J. Baxendell, F. Druce, Sir Napier Shaw, and F. J. W. Whipple. *Treasurer:* W. V. Graham. *Secretaries:* W. W. Bryant and J. S. Dines. *Foreign Secretary:* R. G. K. Lempfert. *Council:* C. E. P. Brooks, Dr. J. Brownlee, Capt. C. J. P. Cave, J. E. Clark, R. Corless, Capt. G. M. B. Dobson, J. Fairgrieve, Lieut. H. D. Grant, H. Mellish, Dr. J. E. Petavel, M. de Carle Sowerby Salter, and G. I. Taylor. The Symons gold medal awarded to Prof. H. H. Hildebrandsson, of the University, Upsala, was presented on his behalf to the Swedish Minister.

MR. IKBAL ALI SHAH gives in *Folk-lore* for December last (vol. xxx., No. 4) a comprehensive account of the folk-life of Afghanistan, a subject about which little information has hitherto been available. He traces the life of an Afghan from the cradle to the grave, his account of the marriage and death ceremonies being particularly interesting. On the whole, though Mr. Shah is perhaps influenced by his natural prepossessions, he gives a pleasing impression of the family life of the people, and the general result is that, as Afghanistan borders on both Persia and India, the domestic rites of the Afghans have been influenced both by Persians and by the Hindu or Mussulman culture of the Punjab.

IN *Sudan Notes and Records* (vol. ii., No. 3, July, 1919) Dr. C. Crossland treats the question "Comfort and Health in the Tropics." "Remove the mosquitoes and the fevers they carry, and most tropical countries can be made fairly healthy." He gives good advice on clothing. "Air which is already moist can have little drying or consequent cooling effect unless it is in fairly rapid motion. Consequently what is known as ventilation in Europe is of little use in the tropics, and houses designed in Europe are never, so far as I have seen, sufficiently airy for the Red Sea coast." Hence he lays down, with the help of diagrams, what is his idea of a suitable house. The author does not appear to have any experience of India, where the subject has been carefully investigated. But the paper will be useful to all who intend to reside in the tropics.

Mr. H. Bolton, Director of the Bristol Museum and Art Gallery, in his report for the year 1918–19, points out that the museum suffered from the necessity of exercising a strict economy in order that the changed conditions of the cost of labour, supplies, and museum material may be met as well as possible by the unaltered pre-war income—conditions affecting institutions of this kind throughout the country. But the educational work has been carried on with success, no fewer than 60,000 visits having been made by wounded soldiers during the war period. The important collection of guild banners has been increased by some welcome gifts; Mrs. C. Ryland presented a valuable series of pictures, and Mr. H. Mardon a large collection of European engravings and his extra-illustrated copy of Nichol and Taylor's "History of Bristol," extended to fourteen volumes and containing almost every known illustration and map of importance relating to Bristol.

Sir C. Hercules Read describes in the January issue of *Man* an ancient Chinese bronze from the collection of Mr. H. Oppenheim. It represents a monstrous mammalian quadruped, winged, with a long neck and a feline head, which seems to be struggling with a snake-like form. Figures of a similar kind are said to have been used as a refrigerator for food, or as a brazier for heating water or wine. Sir C. H. Read remarks that "the practical identity of the Tartar figures and the surrounding animals would further suggest that if one be of the Han dynasty type, the other is also. In any case, the suggestion helps my theory as to the affinities of the Oppenheim bronze, viz. that in some respects it has clear connection with the later Bronze age in the Far East. The architectural treatment of the base is quite un-Chinese, and at the present moment I can think of nothing nearer than Gandhara with which to compare it. Ten years ago such a suggestion would have been thought fantastic, but Sir Aurel Stein's discoveries have reduced it to a commonplace."

Dr. J. W. H. Harrison, continuing his experiments with the Geometrid subfamily Bistoninæ, finds peculiar sex-relationships particularly in inter-generic hybrids of these Lepidoptera (*Journal of Genetics*, vol. ix., No. 1). Occasional inter-sexes, intermediate between males and females, were produced, and in several crosses only males appeared, although all the fertilised ova developed. In such cases the male parent in the cross is found to be "phylogenetically older" than the female. Thus *Nyssia zonaria* × *Lycia hirtaria* yielded males only. A further complication is found in the fact that *hirtaria* has fourteen (haploid) chromosomes, while *zonaria* has fifty-six. An explanation of the results is attempted in terms of intensity of sex-factors.

"Notes on the Survey of India Maps and the Modern Development of Indian Cartography," by Lt.-Col. W. M. Coldstream, R.E., is the title of a volume recently published by the Survey of India. The author traces the history of map production in India and the development of colour printing. The size of sheets, use of symbols, selection of colours, and lettering and other problems in cartography are discussed at length, and the volume is illustrated by forty coloured plates showing specimens of all the most important maps published by the Survey of India, as well as illustrations of several old maps. The collection of these plates alone makes the volume of great interest.

Military operations in the Libyan desert in 1914–18 gave Dr. J. Ball opportunities of taking the latitude and longitude of several places of which the position had not been accurately determined. These are published by the Egyptian Survey (Survey Department Paper No. 34). The positions determined extend from the Nile west to the Siwa oasis and Jarabub, and south to the oases of Kharga and Dakhla. The position of Bir Terfawi, which had hitherto only been guessed at, was determined by Lieut. Moore, who places the well nearer to Wadi Halfa than had been previously supposed.

The question of Suess's "sal" and "sima" magmas is dealt with by Dr. Holtedahl in relation to continental margins in a paper on the causes of large earth-movements, which appears in *Naturen*, 1919, p. 266.

Mr. F. L. Hess proposes (*Amer. Journ. Sci.*, vol. xlviii., p. 377, November, 1919) a new and useful geological term, "tactite," for the body of rock altered by contact with an igneous mass. The abbreviation rendered possible in descriptions of contact-phenomena by the adoption of so simple a word is at once obvious and welcome to geologists.

Memoir 111 of the Geological Survey of Canada, on "The Silurian Geology and Faunas of Ontario Peninsula," is of special interest, since it includes the well-known Niagara group and its development in the Niagara district. Few new species of fossils are described, but the fauna is admirably illustrated by photographs, and two coloured maps are added in a pocket at the end.

All known occurrences of platinum in Canada are described and usefully set down upon a general map by Mr. J. J. O'Neill in Part G of the Summary Report of the Geological Survey of Canada for 1918 (issued in 1919). The conclusion is that "Canada certainly has possibilities of becoming one of the world's largest producers of metals of the platinum group." It appears that at present a very large quantity of platinum, here estimated at 50,000 oz. annually, is lost by the absence of proper methods of recovery in placer working.

M. EMILE BELOT (*Revue Scientifique*, 1919, p. 686) begins in the happiest manner a discourse on vulcanicity in general and on an artificial volcanic field of his own manufacture by reminding his audience of the "big Bertha" that assailed their lecture-hall in the Sorbonne. While the usual height attained by the vigorous projection of volcanic material is 8 km. to 10 km., the dust from Krakatoa rose to 27 km. The experimental volcanoes of the "Bertha" type threw projectiles to a height of 30 km. into a layer where atmospheric pressure is reduced to about 1 mm. of mercury, and the horizontal range thus rendered possible was as much as 120 km. Though the conception was that of a Jules Verne, we must remember that its brilliant realisation was due to the scientific thoroughness of the Germans. M. Belot goes on to show that the lunar crater-rings can be accounted for by normal volcanic projection *dans le vide,* and he then describes and illustrates a model volcano that derives its water from the percolation of an artificial sea.

AT the end of the article upon the Physical and Optical Societies' Exhibition, in the issue of NATURE for January 15, reference was made to the comparative absence of simple forms of apparatus for teaching purposes. The Zenith Manufacturing Co. showed a representative series of its regulating resistances and controllers of very simple form, and the manager of the electrical department writes to say that a special aim is made at instructional needs. We are aware that the company devotes much attention to the details of rheostats for electrical testing, but this affects very slightly the point of the paragraph in question, namely, the desirability of making all apparatus for use in schools and colleges so simple that the principle can be readily understood.

AN important paper by Otto Hahn and Lise Meitner on "The Genesis of Actinium" appeared in the December 1 issue of the *Physikalische Zeitschrift.* In 1908 Boltwood examined a number of uranium minerals, and found that the ratio of their actinium and uranium contents was constant—a result which indicated a genetic connection between actinium and uranium. From these results Rutherford calculated that 8 per cent. of uranium disintegrates along the actinium series. In 1917 Fussler found a value somewhat less than 8 per cent., though only three values were obtained, and these vary as much as 60 per cent. St. Meyer and Hess re-examined the question in 1919, and found a constant relation Ac : U for a set of uranium minerals from various parts of the globe. Hahn and Meitner separate the eka-tantalum [called prot-actinium (Pa) in Germany] from Joachimsthal pitchblende, and compare the total α-ray ionisation from this product with that due to the uranium in the pitchblende. Three methods of separating the eka-tantalum were used, both solutions and residues being examined. The authors find that only 3 per cent. of uranium disintegrates along the actinium series, and the probable error in their results is 10 per cent. This result is in accord with the work of Antonoff and of Hahn and Meitner on UY, which appears to be the mother of eka-tantalum. These workers found that the branch ratio of UY to uranium was about 2 per cent. Hahn and Meitner discuss the available evidence, and conclude that the actinium series originates from UII according to the scheme

$$\text{UII} \xrightarrow[\alpha]{} \text{UY} \xrightarrow[\beta]{} \text{Eka-Ta} \xrightarrow[\alpha]{} \text{Ac},$$

which agrees with that suggested by Soddy in the Trans. Chem. Soc. (vol. cxv., p. 1, 1919). The atomic weight of actinium would thus appear to be 226.

FROM the annual report of the Government Chemist for the year 1918–19 (Cmd. 419) it appears that the total number of samples analysed at the Government Laboratory was 289,180. This represents an increase of more than 20,000 compared with the previous year. Owing to the cessation of hostilities and the subsequent demobilisation of a part of the combatant forces, about 16,000 fewer samples were analysed at the central laboratory; but, on the other hand, the partial revival of trade led to a considerable increase in the number of samples of wine examined, and many more samples also were analysed for the Food Controller and the Air Board. Among other items of interest in the report, two unusual instances of the contamination of foods with metallic poisons may be noted. In one case chocolate sweetmeats were found to contain mercury; this was traced to the metal trays used in the processes of manufacture. In the second instance pastry made from self-raising flour contained antimony, due to the use of tartar emetic as a substitute for cream of tartar instead of the acid phosphate of lime intended to be used as a "tartar substitute."

HORSE-CHESTNUTS have in recent years been utilised for the production of acetone and normal butyl alcohol by a special process of fermentation. The distillate yields a "mixed oil," of which about one-third consists of acetone and the remainder is the butyl alcohol. In the Journal of the Society of Chemical Industry for December 31 Mr. A. Gill gives an account of some experiments carried out at H.M. Factory, King's Lynn, in studying certain aspects of the fermentation. Outstanding features of the operations were (1) frothing and (2) slowness; these were attributed to the presence of æsculin or æsculic acid—a bitter, saponin-like substance which, besides producing froth, is apparently inimical to the development of the special micro-organisms employed. The æsculin can be extracted by treatment of the nuts with water or alcohol. The mature nuts contain about 12·5 to 14·5 per cent. of husk, and immature specimens may have nearly double this proportion. It has been stated that, for successful fermentation, the husk must be completely removed; this was not found to be necessary, though it is an advantage to remove as much as possible, since an excessive quantity retards the fermentation. About 19 per cent. of "mixed oil" was yielded by the nuts.

LLOYD'S shipbuilding returns for the quarter ended December 31 last—commented upon by ***Engineering*** for January 16—indicate that Great Britain has now regained her foremost position in the world of shipbuilding, having 757 vessels under construction, with an aggregate gross tonnage of 2,994,249. This figure is 27,734 tons in excess of the tonnage now in hand in the United States. In all other countries of the world, including the United States and the British Dominions, but excluding Germany (for which country the figures are not yet available), there are 1381 vessels, making 4,867,114 tons in all; so that British tonnage building now amounts to more than 38 per cent. of the world's total. Our shipbuilding industry is thus in a highly satisfactory condition. More than one-third of the total British tonnage now under construction is building in Clyde shipyards.

An interesting paper on radio direction and position finding was read by Capt. H. J. Round to the Institution of Electrical Engineers on January 14. Capt. Round gave a history of the development of the radio goniometer for war purposes which took place immediately war broke out. The record of the difficulties that were overcome is instructive. It was soon found out that the German Navy directed its Zeppelin fleets by direction-finding from land stations. On several occasions, however, when there were nine or ten Zeppelins in a raid all doing their utmost to communicate with their base stations for bearings the German messages got into a hopeless tangle. Our Naval Intelligence operators believed that one special German operator was so skilful that whenever he took control everything proceeded smoothly. The Germans had two radio phare stations which enabled their Fleet and submarines to determine their positions in the North Sea without the necessity of transmitting signals. In each station there was a rotating frame continually sending messages and giving a special zero signal once every revolution. Any operator noting the time-interval between the zero signal and the instant at which the received signal was a minimum could tell at once the angular position of the ship with respect to the station. Doing this for both stations, the position of the ship was determined. During night-time many anomalous results were obtained when direction-finding, the reasons for which have not yet been satisfactorily explained.

Messrs. A. and C. Black, Ltd., announce "Insect Life," by C. A. Ealand, illustrated, and a new edition of "Studies in Fossil Botany," by Dr. D. H. Scott, part i., Pteridophyta, illustrated. *Messrs. Crosby Lockwood and Son* promise "Oils, Fats, and Waxes: Their Manufacture, Refining, and Analysis, including the Manufacture of Candles, Margarine, and Butter," by Dr. G. Martin; "Applied Chemistry for Technical Students," by Dr. C. K. Tinkler and H. Masters; and "The Principles of Air Navigation," by J. E. Dumbleton. The *S.P.C.K.* is bringing out an edition of Clerk Maxwell's "Matter and Motion," revised and brought up to date by Sir Joseph Larmor; also the following new books: "Archimedes," by Sir Thomas L. Heath (in the Pioneers of Progress: Men of Science Series); "The Nature-Study of Plants in Theory and Practice for the Hobby-Botanist," by T. A. Dymes; and "The Book of the Sea-shore," by W. P. Pycraft (the first of a new series entitled The Nature Lovers' Library).

OUR ASTRONOMICAL COLUMN.

New Comet 1920*a*.—A comet of the 10th magnitude has been discovered by Señor Comas Sola at Barcelona. It was photographed by Mr. Wilson at Carleton College Observatory, Northfield, Minnesota, U.S.A., on January 20d. 15h. 51·8m. G.M.T. R.A. 7h. 57m. 40·5s., N. decl. 21° 40′ 54″, referred to the equinox of 1920·0. No information is to hand about its motion. The comet's appearance is almost stellar.

Spectrum of Comet Brorsen-Metcalf.—Pubs. Astr. Soc. Pac. for December contains an account by Prof. Slipher of the spectrum of this comet photographed at Flagstaff on October 17. It resembles that of comet *b* 1914 (Zlatinsky) fairly closely. The third and fourth carbon bands and the first, second, and third cyanogen bands are shown, also six unidentified lines between 4016 and 4074. There is also a faint continuous spectrum.

The Fireball of January 16.—A few additional observations of this brilliant object have come to hand, and they prove it to have been of a very exceptional character. At Diss, in Norfolk, the streak it left remained visible for fifteen minutes.

The height of the meteor was from about 52 to 44 miles, and its velocity 15 miles per second. Its course at first lay above Saffron Walden, whence it travelled to above Watford, and then disappeared. Its radiant point appears to have been in the northern region of Cancer, which was not far above the north-east horizon at the time of the meteor's apparition.

This particular part of the sky seems to be the focus of emanation of many fine meteors in January, but they do not appear to favour any particular date. Thus on January 1, 1913, January 21, 1898, and January 29, 1905, bright meteors were traced to the same point, and it has also been conspicuously active in the months of November and March.

Open Stellar Clusters.—Dr. Harlow Shapley has extended his studies of the globular clusters to include the more widely extended clusters chiefly found in the Galaxy (Proc. Nat. Acad. Sci., Washington, August, 1919). He determines the distances of these objects by methods similar to those employed for the globular ones; the distances range from 60 parsecs for the Pleiades to 16,000 parsecs for one cluster and 14,000 parsecs for four others (1 parsec $=3\frac{1}{4}$ light-years). The average of the seventy clusters discussed is 6000 parsecs. Their centroid is distant some 3000 parsecs from the sun towards galactic longitude 270°. Since these clusters would seem to be embedded in the galactic star-clouds, these results would indicate a greater distance for the latter than that which was until lately thought probable.

Dr. Shapley is inclined to abandon his earlier view that the globular clusters cannot exist in the galactic plane, and break up as soon as they enter it. He realises the cogency of the evidence that there is much absorbing matter in this plane, which conceals objects lying beyond it. He still thinks that the open clusters are the remnants of former globular ones, but does not postulate such a sudden transformation from one type to the other as he did at first.

The Astronomer Royal and Mr. Melotte give some details about one of these veiled regions, which lies in the constellation Taurus (Monthly Notices R.A.S., November, 1919). Since the paucity of stars in the region is the same for all magnitudes, it is concluded that the obscuring cloud is comparatively near us. This diminishes the difficulty of the great mass that would be required if the cloud were more remote.